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THE Congress of the Protestant Episcopal Church, which has just met in New York, brought out a number of papers on church architecture, from which some interesting extracts will be found in the letter of our New York correspondent in another column. This was one of the subjects taken up just before at the Convention of the American Institute of Architects; and it is to be regretted that the discussion of it which would have followed the papers read there should have been choked off by the press of executive business. The question, What shall be done with modern churches? is one of the most interesting that architects have nowadays to consider; and in the United States, at least, where the prestige of the traditional forms is less regarded than in Europe, the study of it is as likely to be fruitful in new developments as any part of their work. The different requirements of liturgical and non-liturgical churches point to differences of type; and architects are somewhat slowly coming to conform themselves to these requirements. The better architects, it must be confessed, being better acquainted with the traditional types, and more sensitive to their beauty, have been on the whole rather slower in conforming than their less instructed fellows, who were trammelled with little knowledge of the past, and who have so done the most of what has been done in developing certain new forms of churches which are really becoming characteristic of our country. The tendency which has told most on the forms adopted for church-buildings has been to regard them as intended more for preaching and social purposes than for worship. This leads to the planning of many groups of buildings, or buildings containing groups of rooms, assigned to various uses, and to the application in certain quarters of the term "auditorium" to the room in which the congregations assemble for preaching and worship. As yet only a few persons, of those who have discussed the subject publicly, — Mr. Cummings at the Convention of the Institute, and Mr. Hunt at the Church Congress, for instance, — have considered the adaptation of the form of the church proper first of all to hearing and seeing the minister; that is, of bringing the congregation together compactly into an unencumbered space about the chancel or pulpit; yet this is usually the first problem which a church committee nowadays lays before its architect. If the wants of the congregational churches of the day are faithfully and ably studied, they bid fair to lead to the development of as interesting and novel forms of architecture as any of our time, however little they may conform to what some persons would consider religious architecture.

SAN FRANCISCO has been contributing her share to the labor troubles that vex Europe and the United States. She has her own special element of difficulty in the prevalence of Chinese labor; an element which keeps her working population in a pretty steady ferment, and gives pretext to her idle population for disorders that every now and then break out into threats of violence, and even such acts as the recent attempts among the "hoodlums" to burn the Chinese quarter. For some time back there has been a series of open-air meetings, called working-men's meetings, in which the most communistic and aggressive movements against the public peace have been urged with increasing energy, until it has come to actual threats of mob dominion, and of personal violence against individual men. The authorities, after letting the meetings go on undisturbed through dread of provoking the lawless classes unnecessarily, have stopped them and arrested a number of the leaders. For the present we have no further account of disturbance; but it is too much to expect that in a city so full of dangerous elements, permanent tranquillity is to be so quickly secured. At present poor John Chinaman serves as a buffer between the disorderly and the better classes; but when he is put out of the way, whether by removing or by crushing him, the law-abiding people will be left to front the full violence of the proletariat, which is in San Francisco exceptionally dangerous. The most perilous fact in these present demonstrations, as in the the late railroad riots, and in other popular disorders of the day, is that the working-man is used as a cover for them, and tricked by the leaders of a mob into lending himself to them. Unless the well-meaning men who do the bidding of trades unions and demagogues can be helped to see that they are playing into the hands of the vilest class in the community, they will yet make themselves responsible in San Francisco and elsewhere for terrible disaster.

THERE seems to be little doubt, at the time we write, that some provision will be made by Congress for the representation of the United States at the Paris Exhibition next year. Possibly by the time this reaches our readers, the proposition of the House Committee on Foreign Affairs touching the matter will have been presented. The interest of the administration in it has been generally known. It is said that Secretary Evarts favors the appointment of several commissioners of equal rank in order to distinguish various gentlemen who were conspicuous by their labors in behalf of the Centennial. When one considers how easy it is for men who are joint representatives of their country in a foreign undertaking to disagree, and impede their work thereby, one is tempted to think that the efficiency of a commission that will have a good deal of hard work to do, and not a great deal of time to do it in, might be best secured by putting a single very capable man at the head of it, — and when we remember what our country has suffered of commissioners in times past, we will add, a creditable man. It is to be hoped that when the matter is laid before Congress by the committee, it will not be allowed to hang fire, in spite of the ten or twelve hundred bills that have been presented before it. The time that remains for preparation is not long, and it is desirable that the men who wish to exhibit should know as quickly as possible what they have to depend upon. Already there seem to be a number of volunteer commissioners in the field, under the name of Exhibition Agents, Representatives of Exhibitors, and the like, whose occupation would be not of very great importance, we should suppose, if a government commission were appointed, and probably useless if it were not. It is not yet clear what appropriation will be asked from Congress. Secretary Evarts's estimate is unequally reported at $225,000, and $140,000, and it is said the committee will ask for $150,000. The Chicago *Inter-Ocean* reports the following estimate: One commissioner-general, $8,000; ten commissioners, $1,000 each; the general expenses of the commission in Paris, $10,000, and the same for freight, transhipment, etc., abroad; $20,000 for freight and shipment in this country, with $8,000 more for preparatory work here; and $9,000 for contingent expenses; but this makes only half the sum proposed. A ship-of-war is expected to be detailed to carry the exhibits across.

WE find in the *Architect* the memorandum prepared by the Royal Institute's committee on the Paris Exhibition, for use of architects who wish to exhibit. The committee has decided "to aim at forming a select collection of works of genu

ine excellence, rather than a large one including works of moderate or inferior character, in the belief that such a collection will most adequately represent our art as practised in this country at the present day, and will be worthy of the position which English architecture may justly claim before Europe." Drawings are invited from all architects of Great Britain and Ireland. The committee announce with careful emphasis that there will *not* be a public exhibition of the offered drawings, but that they will select from them those which are to be sent to Paris. The drawings are to be in narrow frames, with narrow margins, and there are to be no plans except key-plans included in the same frames with the drawings they illustrate. The rule at first laid down by the French authorities excluded all drawings of work executed more than ten years ago; but at the request of the Prince of Wales, who is president of the English Commission, it was modified so as to allow the entrance of work more than ten years old, but placing it "*hors concours;*" that is, not in competition for honors. There has been some talk about collecting drawings of the work of American architects for exhibition at Paris: if it is to be done, it is time that some decisive step toward it should be taken; but the matter is a difficult one. It would not be hard to get together shoals of drawings; but to form, like our English brothers, "a select collection of genuine excellence," is not so easy when there is no fully accepted central authority to make the selection. For the American Institute to offer to do this work, would be, to say the least, a delicate matter. Nevertheless selection is imperative. It is desirable that American architecture should be represented at Paris; but it is more desirable that it should not be badly represented. It will be represented badly however, if at all, unless the drawings that are offered are thoroughly winnowed. It is important therefore, if we are to make any exhibit of architecture, that the United States commissioners, when we have them, should have the assistance, through official appointment or otherwise, of the men best qualified in architecture.

THE lamentable death of Mr. Raphael Brandon, of which late English papers have informed us, takes away another of the English architects who have given good service to their profession by their literary work. He was a pronounced Gothicist, and with his brother, Mr. J. Arthur Brandon, who died several years ago, was the author of three works which are very well known to English and American architects, the Analysis of Gothick Architecture, Open-timbered Roofs of the Middle Ages, and Parish Churches. The first of these at least became an extremely popular pattern-book for architects and draughtsmen. Mr. Brandon was less successful in his practice than in his literary work. He built, however, some prominent buildings, notably two or three churches in London. They are mostly marked by the strict reverence for ecclesiastical precedent in which the first supporters of the new Gothic school walked, and which was the natural outcome of his assiduous study. He was one of the twelve architects selected by the British Government a dozen years ago to submit designs in the famous competition for the new Law Courts. We have heard it suggested, however, that this was done more as a recognition of his standing as a scholarly architect than with a belief that he was the man to carry on successfully so important a work. The design he offered shows his rigid ecclesiastical tendency very clearly, the chief mass in the group of buildings, which contained the great central hall, being to all intents and purposes within and without the simple reproduction of a thirteenth-century cathedral.

WE are sorry to be reminded by a letter from MM. Ducher & Cie., of Paris, the publishers of M. Garnier's splendid monograph on his new Opera House, that neither on the plate which we borrowed from that work for our number of Sept. 15, nor in the letterpress which described it, did we remember to give their house the credit of the publication. We had done so in our first notice of the work (Dec. 2, 1876), but for the sake of those readers who may have seen the later number and not the earlier, we hasten to make amends here. The value of the many architectural publications of MM. Ducher & Cie. is probably too well known to most of our readers to need our indorsement; but we regret our oversight none the less. Our much-valued fellow-journal, *La Semaine des Constructeurs* also, in a very courteous notice of our paper, reminds us with kindness that we borrowed its article and illustration touching the new *Hôtel de Ville* at Paris, without waiting for its authority. While the usages of American papers allow of great freedom in borrowing from each other, provided due credit is given, we much prefer, in dealing with our foreign contemporaries, to consult the etiquette to which they are accustomed; and we offer our apology for transgressing it. We are sure, nevertheless, as regards what we have done, that *La Semaine des Constructeurs*, when it considers that two months must pass between its issue of a number and our receipt of authority to borrow from it, and remembers the proverbial haste and impatience of Americans, will look indulgently on our share of the national weakness.

APROPOS of the *Nouvel Opera* we read in a late number of *L'Art Français* this lively comment:—

Of all the reproaches brought by criticism against the famous architect, that of the abuse of gold seems to have touched him most deeply. He comes back to it again and again, as to a spot which he can never sufficiently obliterate. Thus to those who have found the façade of the Opera House too much begilt, he replies triumphantly, that the gold of this façade did not cost eight hundred francs. Since it is not a question of price, but simply an artistic one, the reply to M. Garnier is obviously: Then, Sir Architect, this merely proves that you got a good deal of gold for your eight hundred francs. But M. Garnier cannot bear to have this gilding made a matter of reproach; and in spite of all his wit, which is certainly very keen and of the best alloy, he thinks he has found an unanswerable argument when he exclaims, "Ah! you have supposed that all this gold was gold. Well then, the vile and precious metal has only entered into my decoration as an accessory. In general there is only a varnish, a sort of pinchbeck applied to architecture." —So be it, but then there is too much pinchbeck.

ARCHITECT AND CLIENT.

II. — CHANGING ARCHITECTS.

WE came back last week to the relation between a client and his architect; arguing the importance to the best interests of the client, not only of full confidence on his part, but of forbearing continuance in their relation. There will be times, however, when the client thinks he finds, or really does find, that he cannot get the service he wants from the architect he has employed; and this not merely from malpractice, conspicuous neglect, or incompetence on the part of the architect, but from what we may class comprehensively as incompatibility. In cases of malpractice, or where neglect or incompetence is conspicuous, the client's remedy is clear; he has only to dismiss his architect, paying what charges the conditions of the case make him legally liable for, and choose another. We leave aside the question of incompatibility of temper; for mere quarrels are a subject on which we do not care to discourse. But when cases occur, as they will occur sometimes, where after sufficient trial it appears that, apart from blame to either side, the client does not get what he wants, and that if he is to get it at all, he must get it from another architect, what is to be done? Of the legal right of a client in such a case — or in fact in any case — to change his architect as often as he chooses, there can be no dispute. The point at which this right may be reasonably availed of, is to be determined in each case by the same common sense and exercise of courtesy that rule in other affairs of life. Here is, nevertheless, a condition of things in which, though particular cases cannot be provided for beforehand, well-considered principles of professional etiquette may be of service in smoothing the way for both client and practitioner.

There are clients who think that they may try on architects as they try hats, not expecting to pay for any but the one they like best. We need not waste time in showing the unreasonableness of this notion. It unfortunately is not without encouragement in the attitude of some of what the *Architect* calls the ragged fringe of the profession; but the decisions of the courts are a sufficient corrective of it. There are architects, on the other hand, who regard a client, once secured, as a kind of exclusive property, with no right even to redeem himself from possession till his work is finished, So far as concerns any attempt of other architects to get at a client who is negotiating with one, this is well, and ought to be zealously maintained; but as regards the freedom of the

client it is most unreasonable, and would put him altogether at the mercy of the practitioner. A professional connection is not a trap, nor is it for the advantage of any profession to try to make it so. Any general attempts at this would be sure to end in something worse than failure. Fortunately for architects it is more troublesome and more costly to employ two of them than one, and therefore there is always one argument to which their clients are accessible and which they can turn in their own favor. It is not very often, nor likely to be, that a client, once fairly embarked with an architect, tries to change him in the middle of his course. That he has a right to, however, and that it is reasonable at times to exercise this right even apart from actual incompetence or malpractice, the profession ought frankly to admit, allowing that there are cases where it is best for the client, though he may have no special fault to charge against the architect he is employing, to call in the services of another, and for the architect to acquiesce in the change. The points of etiquette involved are delicate ones and difficult to discuss adequately; but it is worth while to consider some of the conditions which ought to be maintained. It is a question of conciliating a proper dignity and security of office on the part of the architect, with the best service of the client, that is, in the long run, of the public; and it is not to be forgotten that the best service of the public means the real welfare of the profession; that in fact the welfare of public and profession cannot be studied apart: that is best for each which is best for both.

In the first place, then, a change ought to be at the risk of the client: that is, he must not expect to get the services of two architects and pay only one, unless he has some fault to charge against the other that will stand a legal trial. Where mere personal dissatisfaction is the reason of separation, whether sufficient reason or not, it must be assumed in general that the fault is as likely to be on one side as on the other; and in all professions it is the established rule that service rendered must be paid for, except under the alternative sometimes offered by quacks, — no cure, no pay. The principle which we discussed some months ago, that the professional fee is proportioned to the importance of the service rendered to the client, is from its nature only to be applied by general average. The importance is to be estimated not by the value the client may set on the service himself, but by the average value of such services as usually rendered; otherwise we fall away at once from the principle of payment by a general scheme, and drift back into all the embarrassment of particular adjustment. It is assumed that in every duly established profession the well-qualified practitioner is capable of doing fair justice to the problem that is brought before him; and the average fee is based on this understanding. There is in the practice of them all an element of uncertainty, which cannot be eliminated. This is, in law the decisions of the courts, in medicine the practicability of cure, in the pastoral relation and in architecture the satisfaction of the taste of the parish or the client. Of this uncertainty it is always understood that the client, not the practitioner, takes the risk. If it were the other way it would probably be found that in those professions where the satisfaction of the client is the uncertain element, the risk would be vastly increased; and in all, the usual fees would have to be raised to cover the risk. By such a change the aleatory element, which is the bane of any profession, would be greatly aggravated, and with it an unwholesome competition, bitterness, and strife.

With this condition goes naturally the corollary, that the client must take the risk of selecting a suitable professional adviser; and must not be released from payment of his fees when service has been rendered, because he fails in this. The client's personal peculiarities enter too largely into this suitability to make it fair to the profession to throw the risk upon them. His protection against the oppressiveness of it is in being able to relieve himself of the responsibility when he can make it clear that his adviser's unsuitability is incompetence. Here is the point where architects owe to their clients, what for other reasons they owe to themselves, — some outward means of distinguishing those who have been duly qualified for practice from those who have not. If the dignity and standing of the profession require the establishment of the presumption that an architect in practice is fairly competent for the work that is ordinarily set before architects — and without this presumption we do not see how the architect is to claim payment for his work until his client declares it satisfactory, — the profession ought to be a distinctly marked and duly qualified body of men, who can show a fair warrant for their qualification; so that even if the client cannot easily decide who is a skilful architect and who an unskilful one, he shall not be without the means of knowing who has subjected himself to a proper training and who has not.

The duties of architects in the question we have been discussing are matter for another paper. It is certain that many of them are willing to make the way unnecessarily hard and the footing slippery for each other. We will only venture to remind them here that clients will not be ready to allow them more than they allow to each other; that permanent relations with their clients and secure remuneration are not to be encouraged by hustling each other in a struggle for patronage; and that a policy of unmixed selfishness, such as a good many of them are disposed to pursue, is not in the long run profitable either to the profession or to the individual.

ESSAY UPON SANITARY SCIENCE.

[Delivered Oct. 18, 1877, before the American Institute of Architects, by Col. G. E. Waring, jun.]

YOUR committee has announced me for a paper on "Sanitary Science." It would better describe the intention of my few remarks to use the expression "in Sanitary Practice."

Our knowledge of sanitary questions lacks very much of what is necessary to scientific accuracy. Not only are the terms of the art more or less vague, but we are still very far from being certain as to our deductions concerning its almost fundamental principles.

We read and we hear a great deal about "sewer-gas," "malaria," and "zymotic diseases;" indeed, the nomenclature of the subject is copious and minute. Yet when we come to ask ourselves how much of all our theories is based on clearly ascertained fact and on demonstrable conclusion, we are forced to acknowledge the really primitive condition of our study.

Many deductions from wide-spread observations are of great practical value; but thus far they remain deductions only. Certain conditions of soil and surroundings point to the probability of fever and ague, neuralgia, and consumption; but the sanitary student is still in the dark as to the physical processes by which such conditions produce such ailments.

Exposure to the emanations of decomposing filth exposes us to the danger of typhoid fever, or diphtheria, or cerebro-spinal meningitis, or scarlet fever, or black vomit, according to attending circumstances; but whole populations are frequently subjected to these dangers, without an outbreak of any one of these disorders. Physicans can, thus far, only say that the danger exists. When the disease arises, they are usually able to connect it with its filthy source; but they can by no means demonstrate the exact way in which the cause has produced its effect, nor can they tell why the apparent cause so often fails to produce the frequent effect. Sewer-gas has no scientific definition. Its composition may be even more various than are the materials from which it is formed, and there is hardly a gas known to the chemist which may not be found at one time or another in our sewers and our drains. There is hardly a house that is furnished with the usual plumbing appliances, which is not more or less pervaded, day and night, with the gaseous emanations of the drains. The finer the house, and the more complete its modern conveniences, the more certain it is to be subject to these inroads in all its parts.

If sewer-gas were universally poisonous, very few of our first-class houses would be habitable at all. Why it is, that our people so generally live in tolerable health, under conditions which, while they do not always produce, almost invariably accompany, attacks of zymotic disease, no man can say; and until this is known we shall be more modest if we avoid the use of the word "science," confess our scant knowledge, and apply ourselves to the practical avoidance of conditions which we know to be full of undetermined dangers. We have not yet learned why bad air in the house, or outside of it, sometimes produces zymotic diseases, nor why it does not always produce them; but we *have* learned that in its entire absence these diseases do not arise unless brought to us in our food or drink.

The architect, in his relations with his client, is a practical sanitarian, or the reverse. He has far more to do with the health, and usefulness, and long life of the family which he shelters, than the physician can ever have; and he is in far greater degree answerable for its ailments, and its weaknesses, and its early deaths.

It seems to me that his first great duty — before all art, before all economy, before all constructive ability — lies in the direction of thorough sanitary work. Put a tight roof over our heads, wall out the rude wind, and give us sweet and wholesome air to breathe, and *then* go on with your admirable art, and taste, and skill; but, for Heaven's sake, avoid the mockery of building a beautiful and convenient pest-house.

It seems, in a certain sense, like an absurdity to tell intelligent men the most obvious truths, which they already know perfectly

well; but it may well be the case, here as elsewhere, that well-known truths fail of active realization.

It is a part of my professional work to inspect the sanitary condition of dwelling-houses, in town and country, and to advise as to their improvement. You will pardon me if I say that I have never yet happened to examine a single house which had not radical defects from garret to cellar; and I have frequently been called, as a matter of precaution only, to recently built houses whose owners had spared no expense to make them perfectly wholesome. Of course some of these houses are not built by architects at all, but by the "practical builders" who do so much of the bad house-building the whole country over. There is a good excuse for this bad drainage in houses built even eight or ten years ago, or at least the responsibility attaches in such cases to the owners who should have reformed them, not to the architects or mechanics who built them at a time when the new art of healthful drainage was in its infancy.

But there is only the excuse of public indifference to shield the modern builder in view of his almost universal disregard of simple and well-known methods of wholesome house-drainage. He would consider himself blameworthy if his roof leaked so badly as to destroy the wall-paper of a single room; but he expects no blame — he would often scout the idea that he should be blamed — for a condition of interior drainage which lays the whole household open to an ever-threatening danger.

There is, perhaps, the further excuse of usage. It is not the custom among architects, any more than among physicians, to pay special regard to those sanitary questions which should engage their first attention. The house is built in the usual manner, and the patient is treated for the usual diseases. God cares for the rest, and a submissive people accepts the result.

I do not stand here, gentlemen, to ask you to pay some regard to a new subject, and to consider whether you may not profitably give it a modicum of thought. I ask you to consider, after careful study, whether you should not pay it a very profound regard, and accept it as the one part of your duty to the public, which carries with it a grave question of life and death.

I do not mean, of course, that, under existing circumstances, any real accountability rests on your profession. As such things go, it is the demand that creates the supply; and the people themselves are thus far at fault. The demand has been for handsome houses, or for cheap houses, or for convenient houses; and these you have supplied with great skill and success.

The time is now at hand when the demand will be for healthy houses first of all; and no one can doubt that the enterprise of your order, ever awakened, will achieve a perfection of sanitary arrangement beyond any thing we have thus far conceived.

At present, not one man in ten thousand — literally not one in ten thousand — cares or thinks any thing about this matter, beyond satisfying himself that his house has as good plumbing as other people's houses.

His accustomed nostrils detect no odor, — even where to one fresh from the country the very entrance-hall is tainted with air from the drains; and where he can neither see nor smell offence, he is quiet and content. He has yet to learn that the most serious danger is often unattended by any very marked warning to the senses.

But a change has begun, and we shall soon find that ten in one thousand are bestirring themselves. It will not be very long before public sentiment will turn from indifference to clamoring demand. The people once realizing the miserable condition of their houses (for which, of course, they themselves are responsible), will cast about for a scape-goat; and you will be fortunate, gentlemen, if you succeed in confining their attention to the plumber who has executed their work, and diverting it from yourselves who should have designed it.

Without being in any sense identified with your profession, I have had some knowledge of the degree to which the plumber (the individual or the class), in many instances, guides the sanitary part of the plans and specifications. I am not at all disposed to join in the popular opinion of the plumber. I am brought into frequent intercourse with him, and I have conceived a regard for him as one who does his best under difficult and often tempting conditions. But he is not usually an educated sanitarian, any more than the apothecary is usually an educated physician.

Referring to what I know to be a frequent custom, I would say that the architect is no more justified in leaving the arrangement of supply-pipes and waste-pipes to the mechanic who is to construct them, than the physician would be in leaving the composition of the bolus to the druggist who is to make it up.

In matters of really vital importance the educated professional man should direct every detail of the plans, according to the best light that he can get. He should also exercise such a supervision over the execution of the work as will insure safety at every point.

It would be folly to attempt to say very much about the details of house-drainage work in the few moments at my command here; but there are certain general principles which may be briefly sketched. They are important; and, whether they depend on theoretical knowledge or on practical experience, they are sufficiently well established to guide our practice safely.

1. Effete organic matter cannot safely be retained anywhere within the house, nor anywhere within an unventilated drain which opens into the house, — either directly, or with the inefficient barrier of a water-seal trap.

2. Effete organic matter — whether fæces, urine, food refuse, or other waste — passes more or less rapidly, according to its nature, and according to its condition as to temperature and exposure to air, into a state of decomposition. It is not generally resolved at once into its innoxious elements, but there is an intermediate stage where its molecules re-arrange themselves into simpler compounds (usually gases), which are again changed into their simple and harmless elements, or into oxides.

The chief agent in the rapid change from the first condition to the third is the oxygen of the common air.

3. It is altogether probable that it is in its intermediate condition that effete matter produces its unwholesome effects, — that it is in this condition that it fosters the reproduction of the germs of disease, or the development of whatever disease-producing influence it may possess.

4. Whatever may be the manner in which this foul condition effects its unwholesome influence, its power for harm is much lessened by a copious admixture of common air, — acting both as an oxidizer and as a diluter.

5. All gases — whether the foul air of the soil-pipe or sewer, or any other aëriform matter — are absorbed and given off by water with great freedom. The water in a trap has only a limited effect in retarding the passage of gases from one side of the trap to the other.

6. Air, in the condition which is the very worst in its effect on health, is very often far from stinking gases.

7. Water has the power of absorbing the germs of disease from air with which it is in contact, or of absorbing whatever other agent of infection the air may contain, and of retaining it for a considerable time.

8. Although a water-seal will not prevent the transmission of gases, it does form a barrier to *currents* of foul air, unless subjected to a pressure sufficient to overcome its hydrostatic force.

9. In towns where a proper system of sewerage is provided, and where there is an abundant water-supply, the system of water-carriage is the best means for removing household waste.

10. In the country, the water-carriage system may be perfectly well used, if the absorptive and oxidizing power of the soil be properly employed for its final disposal.

The application of these principles in practice — in the drainage of houses — involves a consideration of circumstances and conditions which vary in different cases. At the utmost they can only guide and control our practical work. The technical details of arrangement, material, dimensions, and construction, all bear with more or less force upon the general result; but we must keep in view the natural laws and conditions which are essential to good sanitary success.

Most existing work violates the first principle that I have laid down, inasmuch as most of our waste matter is retained in the water-trap of the soil-pipe or drain until sufficiently decomposed to pass away in solution in the feeble current; and as the drain is unventilated, even where it is "vented;" and as it has either no barrier at all to the pouring of its exhalations into the house, or only a water-seal which is always ineffective. The decomposition takes place without the presence of sufficient air to carry it quickly to completion, and so establishes the condition most favorable to the production of disease. There is usually a sufficient dilution in the drain or in the sewer to prevent stinking, but not enough to avert danger. In very many cases the cistern or reservoir in the house, by which water is supplied for all uses, is accessible — either through its own overflow, or through intermittent supply pipes — to poisonous gases from the drain, which its contents absorb and with which the water used for drinking is tainted, — and too often poisoned.

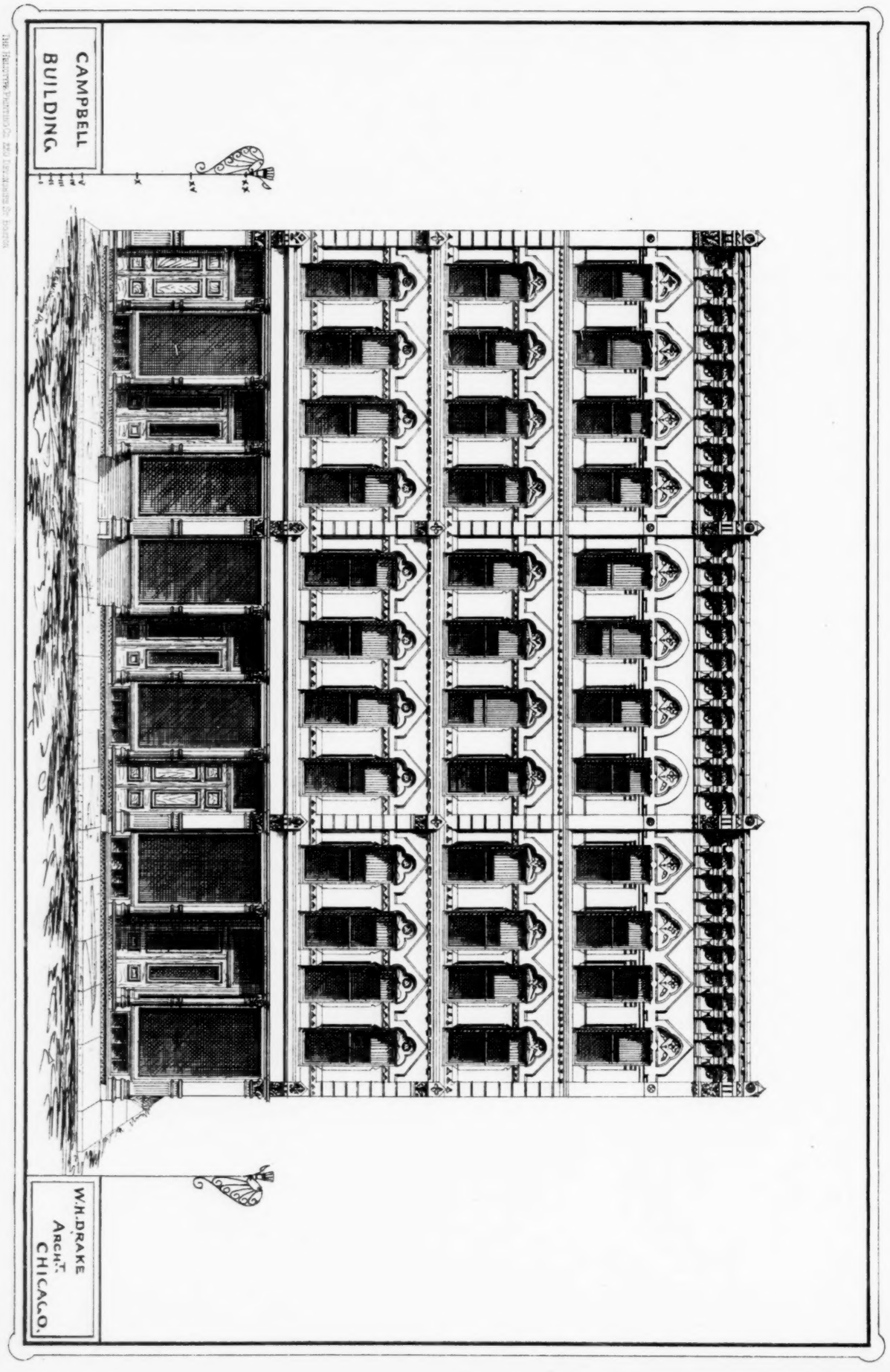
Aside from the dangers inherent in the drainage system of the house itself, it is, if in a city, in connection with a vile public sewer, which is bad in principle, faulty in construction, and a sure source of contamination.

If in the country, it is probably a means for conducting into the house the foul pent-up gases of a pestiferous cesspool.

All of these difficulties may be easily overcome. There is not the least *necessity* for any sort of danger in the use of all the usual drainage appliances in any dwelling-house or public building.

As we are now situated with reference to the public sewerage system in the city, and with the prevalent cesspool in the country, we must arrange to protect ourselves against danger from these sources. We must do away with the use of water-traps so situated that they can retain decomposing organic matter where it will do us harm; we must secure a free circulation of fresh air through all soil-pipes and house drains; and we must either turn our stationary wash-basins out of doors, or secure the absolute closing of their waste and over-flow pipes except when they are actually in use.

Especially must the architect, who is the creator of the sanitary condition of the house, learn to apply to its drainage and water-supply system, the same intelligent and educated skill which he now applies to its arrangement and beauty.


CAMPBELL
BUILDING.
W.H. DRAKE
ARCH.T.
CHICAGO.

ELEVATION OF

A

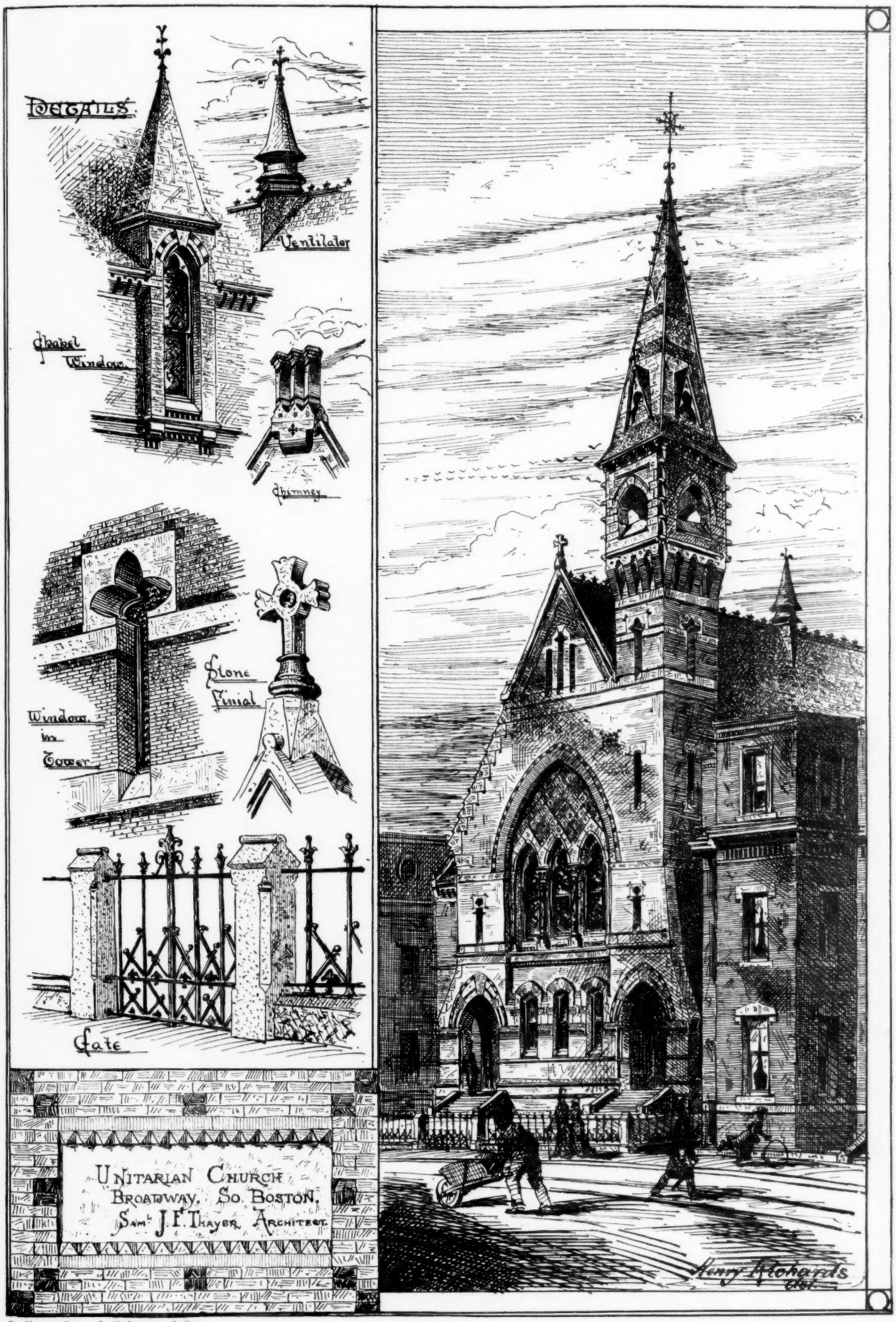
HOOK & LADDER HOUSE

FOR THE CITY OF

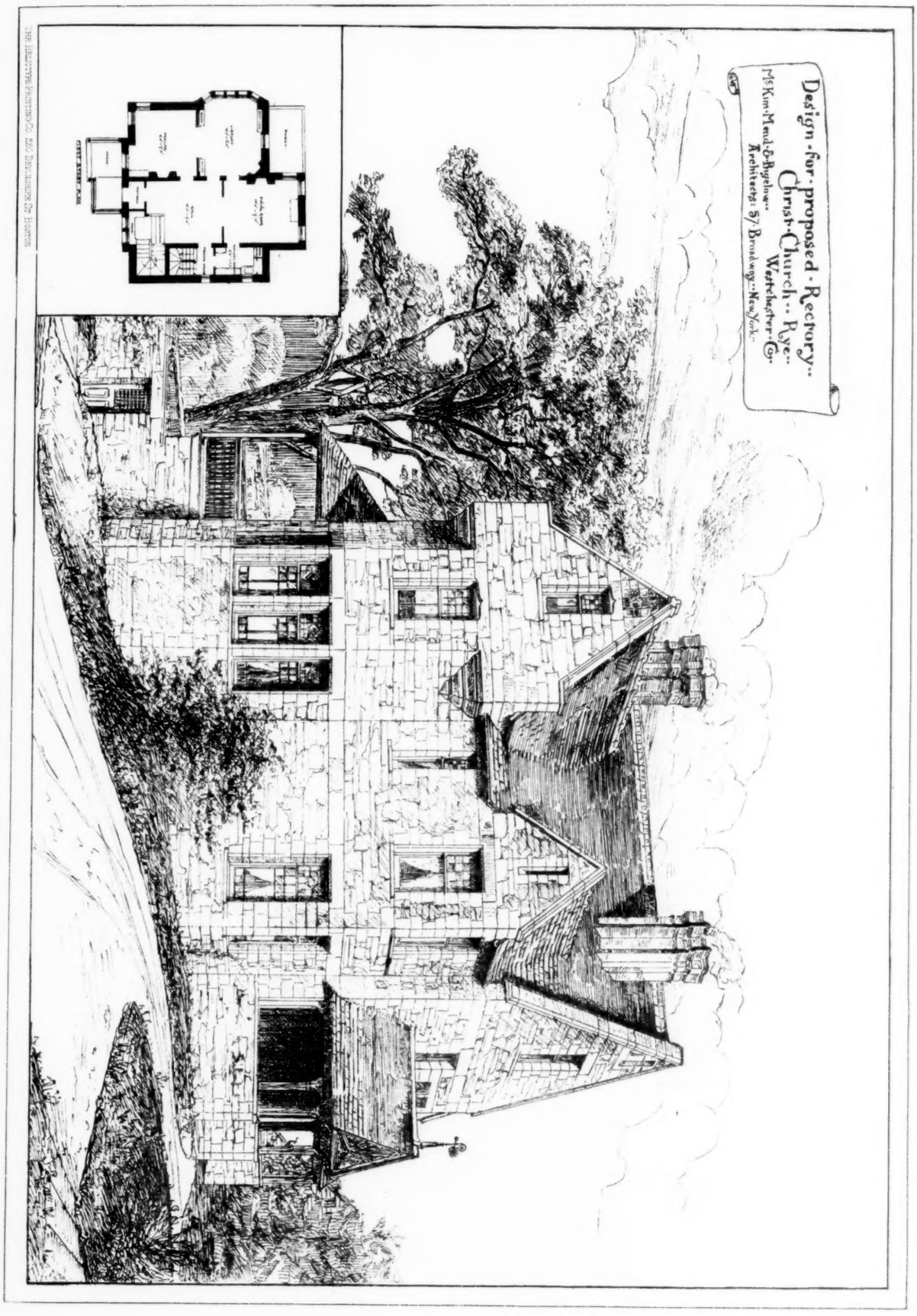
St. John.

N.B.

W. G. Preston, Arch't.



THE HELIOTYPE PRINTING CO. 330 DEVONSHIRE ST. BOSTON.


Design for proposed Rectory
Christ Church Rye
Westchester Co.
McKim Mead & Bigelow
Architects 57 Broadway New York

NEW BOOKS.

EDDY'S CONSTRUCTIONS IN GRAPHICAL STATICS.[1]

THIS is a work which may well be in the hands of every student and practitioner of architecture or civil engineering. It discusses the stability of all forms of the arch, flexible or rigid, and the dome also, by means of the equilibrium polygon — now well recognized as the best instrument for graphical investigation. The processes are new, and the method is a general one applicable to all cases; Professor Eddy's use of them is so clear, that no careful reader can fail to understand them. The book is a contribution of material which cannot be found elsewhere. As compared with other methods, this has the advantage of simplicity and of absolute correctness; avoiding the difficulties and uncertainties that render the application of most systems unsatisfactory. It requires no calculation of the thrust at the crown, or determination of the position of the joint of rupture or of the centre of gravity, and seems likely to supersede other graphical methods. Every student of architecture should master it, and he can hardly have a better teacher than Professor Eddy.

CABLE-MAKING FOR SUSPENSION-BRIDGES.[2]

An air of mystery, and to some extent, of romance, has always hung about the building of suspension bridges in this country. We have indeed known that bridges of this class have attained their grandest development in the United States; have been built of longer spans and been put to harder uses here than anywhere else in the world; and we may individually have admired the finished work at Pittsburg, or at Niagara, or at Cincinnati. But just how the thing was accomplished has never yet been fully stated in print; at least, not before the publication of the little book here mentioned. There was at one time a fashion in bridge-building that led to the building of many wire-cable bridges in Europe, and these were very perfectly described in works of the day. Improving upon these, the late John A. Roebling built the many suspension bridges erected by him in the United States. One feature of these, that was peculiarly his own, was the manner of manufacturing the cable in the place where it was to remain; and this has never before been described in professional literature, or anywhere else indeed, with one exception, so far as known. The exception mentioned, curiously enough, was that of a Sunday-school illustrated paper, which some years ago contained a tolerably clear account of the building of the Cincinnati bridge.

The little book of Mr. Hildenbrand will therefore be very acceptable to many who may be curious to learn how works of this kind are carried on. And because the book gives a detailed account of how cable-making is now done in the building of the New York and Brooklyn bridge, the longest single-span bridge in the world (sixteen hundred feet between the towers), it cannot fail to interest the reader still more. To the profession of civil engineers, the calculations given in detail will be subjects of profitable study and possibly of useful reference in the future.

SANITARY CONDITION IN CITY AND COUNTRY DWELLING-HOUSES.

We have also received No. 31 of Van Nostrand's Science Series on "The Sanitary Condition in City and Country Dwelling-Houses," by Col. Geo. E. Waring, jun., which, as it is only a reproduction of papers originally published in this journal, does not call for a more extended notice.

THE ILLUSTRATIONS.

DESIGN FOR PROPOSED RECTORY FOR CHRIST CHURCH, RYE, N.Y. MESSRS. McKIM, MEAD, AND BIGELOW, ARCHITECTS.

(57 Broadway, New York, N.Y.)

THE rectory is to be built of stone found on the site, laid up in broken ashlar, with brown-stone sills, lintels, copings, etc. The roof is to be tiled. The cost is not to exceed $10,000.

UNITARIAN CHURCH, SOUTH BOSTON, MASS. MR. S. J. F. THAYER, ARCHITECT.

(40 Water St., Boston, Mass.)

This drawing belongs to the series which was prepared for the Portfolio Club, and of which we have already published a number.

THE CAMPBELL BUILDING, CHICAGO, ILL. MR. W. H. DRAKE, ARCHITECT.

(Chicago, Ill.)

The frontage of this building is 77½ feet on State Street, and 145 feet on Van Buren Street. The front is of Athens limestone. The stories over stores are arranged for eight suites of apartments on each floor. The total cost of building completed will be about $45,000. Loring's terra-cotta is used for the cornices on both streets.

HOOK AND LADDER HOUSE, ST. JOHN, N.B. MR. W. G. PRESTON, ARCHITECT.

(186 Devonshire Street, Boston, Mass.)

CORRESPONDENCE.

THE FOURTH ANNUAL CONGRESS OF THE PROTESTANT EPISCOPAL CHURCH.

NEW YORK.

THE Fourth Annual Church Congress of the Protestant Episcopal Church opened its sessions at Chickering Hall in this city, on the 30th ult., with the consideration of the very practical question, "The church-architecture that we need." Opinions, clerical and lay, professional and non-professional, were given; and, as might be expected, there was unity in a few essentials, but diversity enough in the practice suggested to make the advice rather perplexing to the members of the Congress. Among the audience were many of our city architects, anxious to hear, and if possible learn from whatever the discussion might bring forth.

Richard M. Hunt, President of the New York Chapter, A.I.A., read the opening paper, and apparently surprised some of his reverend listeners by his emphatic indorsement of the Greek-cross Byzantine plan as the most satisfactory for modern churches, as appears by the following extract from his paper: —

"In the early part of this century the feeling of dissatisfaction with church architecture, and especially with its unfitness for Protestant worship, led to what is known as the architectural revival. In galleried churches all ecclesiastical considerations are sacrificed to the accommodation of the congregation. The attempt to adapt the basilica for church architecture has generally failed. The great desideratum now is an unencumbered space around the altar. The circular shape is the grandest; but is objectionable because of the reverberation of sound. The oblong form is unobjectionable as far as seeing and hearing is concerned; but it is monotonous. The cruciform shape is symbolical and appropriate; and the nearer we approach the Byzantine church the nearer we come to solving the problem. The Byzantine church undoubtedly offers the best models for Protestant worship."

Bishop Potter of New York took the opportunity, at the finish of Mr. Hunt's paper, to get in a little rub at the architects by recalling a church he had visited in a neighboring city; an admirable structure, with but two defects: "You can neither see nor hear."

Mr. Emlen T. Littell, also of the New York Chapter, A.I.A., was the second speaker; and he boldly espoused the Gothic as the correct choice in church-designing. He said, —

"The church is indeed the temple of God; but it is not for Him alone that it should be built. The temple is the place where the people assemble to be in his presence. The architect of a church, therefore, must take special note, first, of the rites to be performed therein, and second, of the proper accommodation of the people. It is hardly to be presumed that in the selection of the true style to form a basis for our future church, any one will seriously maintain that we have a choice other than the English Gothic. It is the work of the English Church and of the English nation, and we, as successors to both, would scarcely be wise to seek another, even if a better were to be found. New departures are perilous.

"The spirit, rather than the letter, of mediæval times, should be the guide. We must exercise the broadest, the wisest, the most conservative eclecticism. Our architecture must, above all things, be truthful. Our architecture must be symbolical; it must speak to the intellect and soul. The symbols must fill the soul with devotional thought, even when by chance the pulpit sermon only 'preacheth patience.' We must lay under tribute all the resources of art, painting, carving, and sculpture. All these are aids to the purposes for which churches are built, which cannot be slighted without serious loss to the æsthetic qualities of the buildings and to religion. We are such a practical people that we are apt to slight æsthetics, and our buildings and churches suffer thereby. The æsthetic qualities of a church do not depend upon its money value; a fair amount thereof is within the reach of the poorest, with the principle always in view that the church is built for the glory of God as well as for the use of man. The church architecture we need will come to us of itself, not by inspiration, but step by step, though none the less surely."

The non-professional views were laid before the Congress by two papers from members of the clergy. The first was a posthumous paper by Rev. W. A. McVickar, late of Christ Church, New York. It was evidently intended to be a careful and thorough inquiry into the general subject; but being left unfinished by the author, portions of the paper were completed from the rough notes left by him. The spirit of the paper is given in the following summary: —

"'The architect of to-day,' says M. Viollet-le-Duc in his Discourses on Architecture, 'has passed from the possible tyranny of a single princely patron to a servile subjection to many irresponsible masters. Architecture — debated and bandied about among officials, amateurs, academicians, professors, archæologists, antiquarians with a leaning for the Middle Ages, men of science, economists, and monomaniacs — in order to live at all must make a concession to this one, must not offend that, must avoid the persecution of sects, must grope among prejudices, must listen to every one's advice, must direct all its movements in constant fear of envy, hatred, and malice; and when its work is finished no one is satisfied, and the whole town repeats the familiar complaint, "Why do not our architects create an architecture which belongs to our time and country? Here is another building which is neither beautiful nor correct."

[1] New Constructions in Graphical Statics. By Henry T. Eddy, C.E., Ph.D., Professor of Mathematics and Civil Engineering in the University of Cincinnati. D. Van Nostrand, N.Y., 1877. Price, $1.50.

[2] Cable-making for Suspension Bridges, by William Hildenbrand, C.E. D. Van Nostrand, 1877. No. 32 of the "Science Series." Price 50 cents.

"This is, I believe, no exaggerated statement, and one cannot help feeling sorry for a class from whom so much is expected and who receive so little help from the appreciative knowledge of those for whom they work. I know I shall have your sympathy in the statement that art in its highest form is an inspiration of the Creator, and that art admits of no higher employment than that of a sacrificial accompaniment to the praise and worship of God. In the statement that art is an inspiration of the Creator, we at once rise to the recognition of the fact that art is a quality rare in man's works, but all-pervading in those of God, from whom the artist must obtain his inspiration. The believer, then, is bound to be a lover of art. The possible antagonism between art and religion is an unpleasant phase of the truth; but when men worship her carved work and decorations, and the altar is no longer the Lord's, it is only a question of time when the iconoclast becomes the minister of God's truth, and shatters the work with axes and hammers. The two enemies of art as the true handmaid of religion are the utilitarians, who are content with a convenient meeting-house, and, secondly, those who would exclude from the worship of God that idea of sacrifice which needs art for its exponent. Take, as a single example of the way in which nature is pervaded with the elements of art, the human body, which the Greek, according to his light the most conscientious architect in the world, studied to the neglect of almost all the rest of nature. It is entirely made up of noble lines, and colored according to the true principle of a general harmony of unobtrusive tones picked out with brilliant hues. Taking the human form, then, as an example of the artistic perfection of our Creator, the position of man is that of a pupil in the workshop of an absent master, where he ought to become an architect when he comes to love God as God loves him. After giving an architect a full, clear statement of what the requirements of the building will be, he should be left utterly free to create after counting the cost. What he wants most is time, and that is what he seldom can obtain from an American building committee. 'Growth is slow where roots are deep.' There are some things he cannot do, and some that he will not do. What, then, is the church architecture that we need? and what elements have we that fit us for the weighty responsibilities of determining? None but what comes from our own ugly blunders and the failures of those who have gone before. The principles which I think are settled are first in regard to plan: a nave, chancel, and porch, because they were so ordered in the Tabernacle, and embodied by Solomon in the Temple; a gathering-place, a place for holy meeting, and a holy place of prayer. The chancel will always be put at the east, for there are symbolic reasons that we should worship towards the rising sun. Chancel aisles will give a robing-room on one side, and an organ-room on the other. Towers may rise and develop into spires under the law that beauty is the adornment of necessary construction. First, proportion; secondly, adaptation of means to end; and, thirdly, beauty adorning necessity. The architect who excels in harmony of proportion must succeed, and without it there can be no true excellences in architecture. Proportion mastered, a nearer approach demands evidence of our second law, — reasonable and careful adaptation of means to end. Stone-work should be massive, brick-work smooth, and iron light. The roots of the building must give the idea of stability. On the north side of the building individuality will be gained from mass and outline, while on the south side the sunlight should play on varied projections for the effect of light and shade. Vines should grow on the north side as moss does upon a tree. Ornament in moulding and carving is only to add to the necessary the charm of gracefulness, and to the perfectly appropriate the perfectly beautiful. In exterior decoration the effect of the shadow of the ornament should be borne in mind, and should fall on a plain surface. Interior ornamentation admits of greater latitude. Shadow here has no part to play; there are only gradations of light. Ornament should gather richness as it approaches the chancel and climax. Let me protest against lath and plaster, for it destroys all hope of real ornamentation, and it is not worth it. Let there be a double wall, the inner one of clay, which will receive coloring. The church may well be wainscoted with slabs of marble. In the chancel let there be richer wood-work and brass. On the altar-place gold and silver and fine needle-work."

Rev. C. W. Ward of Providence, R.I., closed the subject with a paper in which he ran riot through all the popular and specious objections which are made against many of our church edifices; and by a sensational style of treatment succeeded in drawing much laughter from the otherwise dignified auditory. Rev. Mr. Ward said, —

"Architecture is an art of the greatest latitude. John Hope calls it an art of direct utility, and Mme. de Staël 'frozen music.' It is both. There are therefore many ways of approaching this subject of church architecture. But the real question before us is what is neither technical nor artistic, but practical and social; not what church architecture is the most refined or correct, not what might be prescribed by the *Ecole des Beaux-Arts*, or a General Council, or a Pan-Anglican Synod, but what we need substantially now and here. We may thank God, if we please, that we are not as other men are, nor even as those Puritans who worshipped in holy barns; but we must remember that their holy barns were an honest and national outgrowth, and when we go down to our own houses we must see to it that we are in this respect justified as well as they. Our danger to-day is that we shall fail to do this; and that what with our abnormal sensationalism, resulting on the one hand in 'holy zebras,' and our abnormal ecclesiasticism, resulting on the other in Gothic anachronisms, our architecture may result in dilettanteism. 'What is the church architecture that we need?' links itself, then, to the still larger question: 'What, on the whole, is the church work that we need?' Now, we need two things: First, we need preaching churches; not, indeed, Sunday circuses, or sabbatical lecture-rooms, or ecclesiastical theatres consecrated to the goddess of pyrotechnic sound, or the demon of histrionic noise, but churches in which all traditional or artistic considerations shall be rigidly subordinated to the necessities of acoustics. We must hear and be heard in spite of clerical sore throats and æsthetic designs alike. Those who have ears to hear must be enabled to hear.

"There are three rejoinders to this. The first is the mediæval retort, by which we are reminded that we are in some way pinned to the skirts of our English mother, or of our Italian grandmother; that there is a taste for the 'dim religious,' the far-in obscurity of cubby-hole chancels, and the 'catholic' fancy for cloistered side-aisles, or the coy flirtations of clandestine lady chapels; whose votaries regard a service the more divine for being incoherent, and more 'churchy' for being mysteriously incomprehensible.

"The second retort is devotional, and makes an issue between pulpit-churches and altar-churches. An honest piety feels bound to choose the altar horn of the dilemma. But an altar-church must not necessarily be a 'deaf church.' A devotional atmosphere is easily united with a pulpit-church.

"The third retort is practical, and we are reminded that we do not know enough about acoustics to build upon them. But we do know something about acoustics, after all. We do know that sound is impeded by draperies; therefore let us do away with cushions and carpets, except when they may be needed to prevent reverberation.

"We must have no more of those high-roof Gothic tie-beams in which the gospel is so often snared like an incautious insect. And we must learn to light our churches from above. We must abolish our Gulf-streams of furnace heat; and we must have a good deal of common air, and as little gas as is incidental to our fallen state. We want, too, more of amphitheatral or paraboliform interiors. The Gothic, classic, and every other 'ic,' as such, is out of court. We shall be articled to none of them. Religiousness of atmosphere is bound up in no single one of them. Only, whatever form is adopted, let the architect count himself a failure who builds his church and pitches it within and without with polychromatic marvels, and then, after all, has to resort to those pernicious clerical backgrounds commonly called sounding-boards, that have consigned so many congregations to somnolency, and so many ministers to oblivion (or Europe). The second demand to-day is for social churches — not indeed, kitchen-churches, or parlor-churches, for the odor of beefsteak is worse than incense, and Mrs. Grundy is as bad as the Pope; but by social churches I mean those which shall recognize and meet the demands so strongly felt for secular work, in the way of reading-rooms, dispensaries, and all such humanizing agencies. Social science has been too long left to the Samaritans, while the priests and Levites have been passing by on the other side; and the Church must realize that prayers for the dead can no longer take the place of linen bandages. The Christian Church is essentially a social church; a parish church should be to-day what the bishop's palace was of old, the centre where the people could find social as well as spiritual life. Let us not have a house of prayer for Sunday pew-holders, or a pleasing spectacle for tourists, or the most correct and unpaid-for building that a church-warden ever looked at once a week; but a family home, with dispensaries and reading-rooms, and, in short, as far as possible, something to supply the wants of those who have no homes of their own. There is very much in that good old Anglo-Saxon word 'house' to make us think when we speak of the 'house of God,' for house means shelter. So would I have our church architecture blended with our social life, that every stone should express the beneficence of our age, expressing itself through the Christian Church; and so would I have it that the antiquary, ages hence, when stumbling on the ruins of our work, might say: 'I have found in brick and mortar the record of a permeative gospel, and by so much have I found the record of a faithful art, as well as of a noble church.'"

BRONZE CASTING.

IT is a most singular fact that melted gold, silver, copper, and iron, if poured hot into a mould, will take the impression that retains on cooling all the details of the pattern from which the mould was made, only when the mould is made of sand. Zinc can be moulded in copper moulds, and that is the principal cause of the low price of spelter or zinc statuettes, known in the trade as imitation or French bronze. The real bronze is an alloy of copper, zinc, and tin, the two latter metals forming a very small part of the combination, the object of which is the production of a metal harder than the pure copper would be, and consequently more capable of standing the action of time, and also less brittle and soft than zinc alone would be.

The original statuette is generally finished in plaster. The manufacturer's first operation is to have it cut in such pieces as will best suit the moulder, the mounter, and the chaser, for very few bronze statuettes are cast all in one piece. Arms and legs are generally put on after the body is finished. The next operation is to reproduce the different parts of the figure in metal. For this the moulder takes it in hand to prepare the mould. He begins by selecting a rectangular iron frame, technically termed a flask, large enough for the figure to lie in easily. To this frame, which is from two to six inches deep, another similar frame can be fastened by bolts and eyes arranged on the outside of it so that several of these frames superposed form a sort of box. The workman places the plaster statuette, which is now his "pattern," on a bed of soft moulding sand inside the first iron frame. The sand used for mould-making is of a peculiar nature, its principal quality being due to the presence of magnesia. Only in one locality in the world is found the best sand, that is at Fontenay-aux-Roses, a few miles from Paris in France. This sand, when slightly damp, sticks together very easily, and is well fitted to take the impression of the pattern.

Once the pattern embedded in the sand, the workman takes a small lump of sand, which he presses against the side of the figure, covering a certain portion of it. Next to this piece he presses another, using a small wooden mallet to insure the perfect adhesion of the sand to the pattern. Each one of these pieces of sand is trimmed off, and a light layer of potato-flour dusted both over the pattern and the different parts of the mould, to prevent them from adhering together. In course of time the entire part of the pattern left above the first bed of sand on which it has been placed, will be covered with these pieces of sand, which are beaten hard enough to keep together. Loose sand is now thrown over this elementary brickwork of sand, if it may be so called, and a second iron frame bolted to the first one to hold the sand together, which, when beaten down, will form a case holding the elementary sand pieces of the mould in place. The workman now turns his mould over, and removes the loose sand which

formed the original bed of the pattern, and replaces it by beaten pieces, just as he has done on the upper side.

We can now easily conceive that if the mould is opened, the plaster pattern can be removed, and that if all the pieces of sand are replaced as they were, we shall have a hollow space inside the mould which will be exactly the space previously occupied by the pattern. If we pour melted metal into this space, it will fill it exactly, and consequently, when solidified by cooling, reproduce exactly the plaster pattern. For small pieces this will answer very well; but large pieces must be hollow. If they were cast solid, the metal in cooling would contract, and the surface would present cracks and holes difficult to fill. To make a casting hollow, it is necessary to suspend inside the mould an inner mould or "core," leaving between it and the inner surface of the first mould a regular space, which is that which will be filled by the metal when it is poured in. This core is made of sand, and suspended in the mould by cross wires or iron rods, according to the importance of the piece. A method often used in preparing a mould named by the French *cire perdue*, will help to illustrate this. The artist first makes a rough clay image of the figure he wants to produce. This will be the core of the mould; he covers it with a coating of modelling-wax of equal thickness, and on this wax he finishes the modelling of his figure. The moulder now makes his sand-mould over the wax; and when it is completed by baking the mould in a suitable furnace, the wax runs out, leaving exactly the space to be filled up by the metal. The celebrated statue of Perseus, by Benvenuto Cellini, was cast in this way, and it is very frequently employed by the Japanese and Chinese. Sometimes flowers, animals, or baskets are embedded in the mould; and after the baking, the ashes to which they have been reduced are either washed or blown out to make room for the metal. This can easily be done through the jets or passages left for the metal to enter the mould, and through the vent-holes provided for the escape of air and gases.

When the mould has cooled, it is broken to remove the casting it contains; and here is the reason why real bronze is so much more expensive than the spelter imitation. For each bronze a new sand-mould must be made, while the zinc or spelter can be poured in metal moulds which will last forever. In this way the pieces are produced with but little more labor than that required to manufacture lead bullets. These pieces, of course, do not receive the same expensive finish as the real bronzes. When the casting is taken out of the mould it goes to the mounter, who trims it off, files the base true, prepares the sockets which are to receive the arms or other pieces to be mounted, and hands the piece to the chaser. The work of this artisan consists in removing from the surface of the metal such inequalities as the sand-mould may have left, and in finishing the surface of the metal as best suits the piece. The amount of work a skilful chaser can lay out on a piece is unlimited. In some cases the very texture of the skin is reproduced on the surface of the metal. This mode of chasing, called in French, *chairé*, and in English, "skin-finish," is, of course, only found on work of the best class. Sometimes pieces are finished with slight cross touches similar to the cross-hatching of engraving. This style of finish, which is much esteemed by connoisseurs, is named "cross-riffled" or *ribouté*. After the chaser has finished his work, the piece returns to the mounter, who definitively secures the elements of the piece in their places.

The next process is that of bronzing. The color known as "bronze" is that which a piece of that metal would take through the natural process of atmospherical oxidizement, if it were exposed to a dry atmosphere at an even temperature. But the manufacturer, not being able to wait for the slow action of nature, calls chemistry to his aid, and by different processes produces on the surface of the piece a metallic oxide of copper which, according to taste or fashion, varies from black to red, which are the two extreme colors of copper oxide. The discovery of old bronzes, buried for centuries in damp earth and covered with verdigris, suggested the color known as *vert antique*, which is easily produced on new metal by the action of acetic or sulphuric acid. In the fifteenth century the Florentine artisans produced a beautiful color on their bronzes by smoking them over a fire of greasy rags and straw. This color, which is very like that of mahogany, is still known as Florentine or smoked bronze. Bronze can also be plated with gold and silver, nickel and platinum, like every other metal. — *New York Tribune.*

PRESERVING TIMBER.

THE subject of preserving timber from decay is one that has for a long time excited attention in Europe. There wood has become so scarce and valuable that any successful method for accomplishing the results mentioned could not fail to be appreciated and taken advantage of. In the United States it has been somewhat different. In the past, timber has been abundant and cheap, so that artificial methods for preserving wood here have not commanded general attention. The fact is becoming patent, however, that even here, where timber has been so abundant, the quantity available is rapidly lessening. It is evident that something must be done to diminish the increasing drain upon our forests. For some forty years the method of preserving wood by filling its pores with creosote oil has been known and used in Europe, and its perfect reliability is no longer there a matter of experiment. Railway ties laid in 1840 are still in use in England, and piers and other marine works constructed in 1850 from creosoted timber are perfectly sound to-day in localities where, had they been built in timber in its natural state, they would have been totally eaten away by the teredo within four years. In the United States but very little comparatively has been done in this matter, partly for the reasons previously mentioned and partly because suitable works for creosoting lumber have not been in existence. Mr. Ira Hayford for the past ten or twelve years has devoted his time and energies to this subject practically. In 1872 and 1873 he was engaged at the Charlestown Navy Yard by the government in creosoting the timbers of the "Vandalia;" and white oak timbers two feet square and sixty feet long were impregnated to the heart with the oil. Mr. Hayford's creosote system is based on the fact that the sap and water must first be withdrawn from the wood, and then the preservative oil forced into its empty pores. The effect of the heat used in the process is to cook the albumen of the wood, and destroy its liability to putrefaction. This part of the process alone would add greatly to the length of life of timber.

Mr. Hayford has improved his processes and machinery of late, so that the work of infusing the creosote is done more perfectly, quickly, and cheaply than formerly. His cylinder is made of half-inch iron and double steam riveted. It has been tested by a cold hydraulic pressure of two hundred pounds to the square inch. At either end are heads which open, being in the form of a half globe, of five-eighths inch flange iron. These heads swing on a hinge, and when closed are held in place by bolts worked simultaneously by a large screw.

A railroad track three feet six inches wide runs through the cylinder and onward outside at either end. Iron cars containing the timber run into the cylinder, and when the creosoting process is over they are withdrawn. The capacity of the cylinder is 20,000 feet of timber, or 500 railway ties. When the cylinder has been packed, it is heated to about 225 degrees by steam running through 1,400 feet of coil from a boiler of 85 horse-power. On one side of the building is a pump having a steam cylinder sixteen by eighteen inches, and an air cylinder twelve by eighteen, the latter being provided with a water jacket to keep the air cool. This pump was made by the Blake Pump Manufacturing Company, under Mr. Hayford's patents. In order to prevent the sap of the wood from evaporating too rapidly under the steaming process and causing the wood to crack, atmospheric air is forced in by the air-pump at a pressure of from twenty-five to thirty pounds to the square inch. When the sap is evaporated the steam is cut off, and the apertures of the cylinder opened to allow the steam inside to escape. Then the vacuum pump is used for the purpose of drawing off the moisture and vapors of the wood. A vacuum of from twenty-six to twenty-eight inches is attained, by which means the timber at the end of this stage is left dry, the sap having been all extracted and the pores of the wood opened for the reception of the oil. The proper valves having been opened, the vacuum pump again becomes a force pump, and pressure is applied to the creosote in a large oil-tank sunk in the floor.

The creosote, heated to the boiling point, is thus forced through a series of perforated pipes in the main cylinder, from which the oil falls in a continuous shower upon the timber. When the oil in the tank is exhausted, the connection with the tank is closed, and pressure applied to an air-injector below the cylinder, into which the oil falls which has not been absorbed by the wood. The air, passing through the oil with great force, carries it back through the perforated pipes, and keeps up a continual revolution until the wood has been thoroughly impregnated. The timber is thus thoroughly creosoted, the process requiring one day. That the creosote is thoroughly infused through the pores of the wood, is evident by sawing off a section in any part, and examining it. For use on land about seven pounds of oil per cubic foot of timber is considered sufficient for thorough preservation, but for marine timber more is used.

This process is applicable to all kinds of soft or hard wood, and a great consideration is that it at the same time gives a thorough seasoning to the timber. — *Boston Journal of Commerce.*

NOTES AND CLIPPINGS.

THE NEEDLES OF CLEOPATRA. — The following statements embody some views held by Mr. Erasmus Wilson, who originated the idea of carrying an obelisk to England: The five monoliths known as Cleopatra's Needles stood originally in the city of On, or Heliopolis, in front of the temple wherein Moses received his education in the laws and philosophy of the Egyptians. They are therefore monuments of an era in Egyptian history closely interwoven with the history of the Old Testament; Rameses, one of the hewers of the obelisk now afloat, having probably been the oppressor of the Jews, while his successor, Menephtah, was undoubtedly the Pharaoh of the Exodus. Mr. Wilson also states that an ancient sycamore-tree in the village of Mutareeah, adjacent to On, is believed to have given shelter to the Holy Family in their flight into Egypt.

THE BROOKLYN BRIDGE. — The top of the Brooklyn pier of the East River Bridge presents a scene of comfort as well as activity. While the men are engaged in running the wire over the river, Engineer Farrington, in a small but comfortable building erected for his benefit, directs the movements of the workmen, and occasionally comes forward to make some alteration in the position of the cables or machinery. This is the first winter that preparations have been made for the comfort and accommodation of the workmen. Last winter the men were engaged upon such work that it was impossible to provide for their comfort while working; but this year small houses have been erected upon the cradles to protect the men. Other arrangements have been made for the comfort of the men during working hours. The cable-making machinery, on the Brooklyn anchorage, is on the same general plan as that used in making the cables for the Covington and Cincinnati suspension-bridge, with some changes to suit different requirements. Mr. Farrington stated yesterday, that he had thus far completed twenty strands, and placed them in position. The men are now working upon the twenty-first. As fast as the wire is galvanized, it is placed in the machinery and sent over the river on the endless working rope, thereby being placed in position. Work on the approaches is going forward rapidly. On the Brooklyn side the second pier has been completed, and in a few days the men will have finished pier No. 4. On the New York side, one block of buildings on Pearl Street, between Cliff Street and the Harper Building, has been demolished, while the interior of the buildings on the opposite side have met with the same fate. As the outer walls of these buildings will not be in the way of the bridge for some time, they have been left standing. — *N. Y. Tribune.*

TAUNTON WATER WORKS. — The New Bedford, Mass., *Mercury* says: "The Superior Court at Taunton has been occupied for the past week in the trial of three cases growing out of the establishment of the Taunton Water Works, and some interesting features in hydraulics have been under discussion. These works are upon the Holly system, and consist of a filter basin about 400 feet long, located by the side of Taunton River. From the basin, which is several feet below the bottom of the river, and into which water filters, the engines pump directly into the pipes, without any reservoirs whatever. The land slopes gently upward from the basin for about 300 yards; and the petitioners claimed that the water came from the land, and not from the river. Upon the question many scientific gentlemen testified, including Prof. Hayes of Boston, Mr. Herschel of Boston, civil engineer for the petitioners, and Prof. Nichols of the Technological Institute, Mr. Rotch of Fall River, and Mr. Martine, civil engineer for the city. Some thirty witnesses have been examined, and elaborate experiments by tubular wells and otherwise have been made to ascertain the real truth. The jury were charged Tuesday morning by Judge Brigham, and a verdict was rendered for the plaintiffs in all their cases."

A CORNER IN RAILS. — The Bessemer-steel manufacturers, after a session of several days in this city, perfected among themselves an agreement to advance the price of steel rails; but when the effort was made to obtain the signatures of the operators embraced in the scheme, one of them refused to attach his name, rendering the project inoperative. The substance of the agreement was this: Two dollars was to be paid into a general fund for every ton of rails manufactured, and the accumulation divided at stated periods among the companies owning the Bessemer process. Rails were to be furnished at Troy for $50 per ton; at Cleveland, for $50; at Chicago, for $51; Joliet, Ill., $51; St. Louis, $53. The mills at other cities were to be unrestricted in production, and comprised the Edgar Thomson Works, of Pittsburg; Cambria Iron Company, of Johnstown, Penn.; Pennsylvania Steel Company, of Harrisburg; Bethlehem Iron Works, of Bethlehem; and the Lackawanna Iron and Coal Company, at Scranton.

These mills, it is argued, cannot manufacture more than 250,000 tons of rails in a year; and, as the consumption for next year is estimated at 400,000 tons, the six other mills having the Bessemer process would have only 150,000 tons divided among them; but it was claimed that, in addition to the greatly advanced price per ton, they would be amply paid for their restricted work by their shares in the $500,000 royalty on 250,000 tons to be paid in by the unrestricted companies. Existing contracts were not to be disturbed by the scheme; and the New York Central Railroad contract, at $40 per ton, was to be fulfilled at that price.

The new combination, on the other hand, it was alleged, would result in a rich harvest to the unrestricted companies, who would increase the price to $49 per ton at once, take large contracts for the West and South at least $1 per ton lower than the combination schedule, and thus draw the trade to this State. For instance, the Vulcan Iron Works of St. Louis would be required to charge $53 per ton, an increase of $10 over present rates, which would divert its trade to Pittsburg, where the rails could be secured for $49, or even less. — *Philadelphia Record.*

AMERICAN EXHIBITS AT PARIS. — A cable despatch from Paris states that a semi-official denial has been made of the report that the French Government will allow Americans to take part in the Paris Exhibition, even if no commission is appointed. Gentlemen prominent in the movement for the representation of this country at Paris said yesterday that the denial could not be official, for Duke Decazes, in a letter which has been published in the *Tribune*, declared, "If the Minister of the United States takes under his protection the applications of his fellow-citizens to us, we will accept their requests, and act upon them."

GRECIAN STATUES IN THE DUOMO AT FLORENCE. — The workmen engaged in repairing the front of the cathedral at Florence recently, in removing a thick coating of plaster at one of the corners of the building, discovered seven marble statues, pronounced by connoisseurs to be of the best period of Greek art.

FIRES IN CHICAGO. — Below is a list of the fires for the month ending Oct. 31: —

Alarms, 42; stills, 9; total, 51. Class of buildings — Frame, 25; brick, 13. Occupation — Dwellings, 6; barn, 9; saloon, 4; and 1 each of tea-store, boiler-room, photograph gallery, lumber dry-kiln, theatre, tenement, elevator factory, horse-shoe nail factory, bakery, shed, butcher shop, bung factory, honey and sirup factory, gents' furnishing store, junk shop, and mattress factory. Origin — Traceable to maliciousness, 6; mischievous boys, 3; fraudulent intent, 4; defective furnace, 2; spontaneous combustion, 2; refuse match or cigar-stub, 4; stove-pipe run through and setting fire to plastered partition, 1; woodwork over boiler exposed, 1; movable gas-jet turned against wood, 1; ignition of kerosene from which lamp was being filled, 4; lamp tipped over in drunken row, 1; children playing with matches, 2; sparks falling among shavings and refuse, 2; wind blown down smoke-stack, 1; foul chimneys burned out, 5; ignition of clothing hung around stove to dry, 1; insufficient flue, 1; heated journal, 1; defective flues, 3; false alarms, 6; total, 51. Actual loss, $50,470.

TO THE ARCHITECTS OF THE SOUTH-WEST. — Official investigation shows that more than a dozen court-houses have been burned in Texas by incendiaries, who were interested in destroying records therein contained, which might be used as evidence to convict them of selling thousands of acres of land on fraudulent deeds. About sixty persons have been arrested as engaged in the plot to cheat the government.

NINETY-NINE FAMILIES IN ONE HOUSE. — The death of Tihmintz Moritz, a child nine months old, at No. 98 Mott Street, New York, was reported at the Board of Health recently, and a certificate of burial asked for. Upon investigation it was found that the tenement-house in which the death occurred contained ninety-nine families, or nearly five hundred persons. The wretched families are living, in many cases, in but a single room.

FALL OF A BUILDING. — The rear wall of a two-story brick stable, at No. 237 East Twelfth Street, New York, fell Nov. 4, damaging the building, and crushing a carriage. A foundation for a new building had been dug close to the wall, and had undermined it.

EXPLOSION IN A SEWER. — A lighted cigar was carelessly dropped through an aperture in a sidewalk in Liverpool, recently, with the following result: the pavement opened with an explosion; flames issued forth, and a stone weighing three hundred pounds rose in air. The sewer-gas continued to burn for a long while after the explosion. There are several morals that might be drawn from this occurrence, but most of them will be obvious to the reader.

THE FLOATING NEEDLE. — A private letter printed by the London *News* gives some interesting information respecting the voyage of Cleopatra's Needle. The vessel containing the obelisk pitched tremendously during the transit, her nose dipping under and rising above the water at an average of fifteen times a minute, and the strain upon the towing ropes was tremendous. The maximum speed attained was only six knots an hour.

A CRITIC ON HIS OWN WORK. — Mr. Ruskin's Oxford lectures this year will consist of a series of twelve readings in "Modern Painters," collecting the passages which the author thinks likely to be permanently useful.

PRIZE OF BEAUTY. — The French journals are laughing at the announcement in a Spanish paper, that a prize, or rather sixty-one prizes, are to be awarded during the coming exhibition at Paris, to the sixty-one most beautiful women in the world. The decision is to be made by a jury formed by a lady and gentleman from each nation. If the most beautiful of all, the Queen of Beauty, be poor, her expenses are to be paid, she is to be regally clothed, and go home again with a magnificent prize. As the decision is to be made partly by the aid of photographs, it is to be feared that unless the fanciful Spanish journal prints a contradiction, many a Spanish señora or señorita will waste her money in photographs.

INCOMBUSTIBLE PAPER. — Two Spanish gentlemen of Salamanca have just obtained a patent in Spain for making writing-paper incombustible. A number of experiments have been made with the process, and the results are said to have been very satisfactory. The paper will not burn, no matter what may be the intensity of the heat applied. A single sheet submitted to the direct action of a flame will carbonize, but does not take fire. If a roll of prepared paper is placed in the hottest fire, the outside leaves will carbonize, and the edges for a short depth; but the interior remains unaltered, the writing or printing being perfectly legible. Papers already written or printed upon may undergo the process without injury. The patentees expect to make an arrangement with the government to apply the process in the manufacture of the paper used by it for public business.

A LARGE TANK. — At Kanthalai, Ceylon, there is a magnificent tank on a scale so enormous that it would now cost more than five million dollars to erect it. It was constructed about A.D. 275. Still more remarkable is the great store tank of Kalowewa. Its circumference is supposed to have been hardly less than thirty miles, and it was kept full by two rivers. Channels extended from it over fifty miles, which conveyed an unfailing supply of water to certain large store tanks and thence to minor village tanks. The Ceylon Government proposes to gradually restore many of these great works. Here we see how the ancients prevented famines.

THE TRANSPORT OF MONOLITHS. — The huge granite monolith which supports the horse of the statue of Peter the Great at St. Petersburg was rolled from Finland to St. Petersburg upon cannon-balls.